

GABI Star

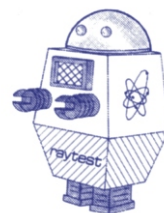


Gamma

Radioactivity

Monitor

for HPLC and GC

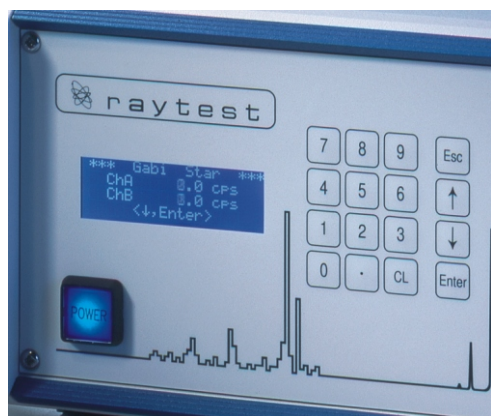


RADIO-DETECTION



Stand-alone operation mode

- Data transfer of radioactivity intensity information to any HPLC system using analog output voltage (1V)
- No PC required
- Instrument control with built-in keyboard / display
- Parameter and spectrum printout on serial thermo printer



Instrument handling via integrated keyboard/display

Control of:

- Measurement channel selection
- Discriminator thresholds
- Energy calibration
- Spectrum scan
- Smoothing
- Background subtraction
- Analog output range

EXCELLENT LINEARITY

Remote-control operation

- Full control of GABI Star and entire HPLC system by GINA Star software
- Digital Data acquisition according to GLP



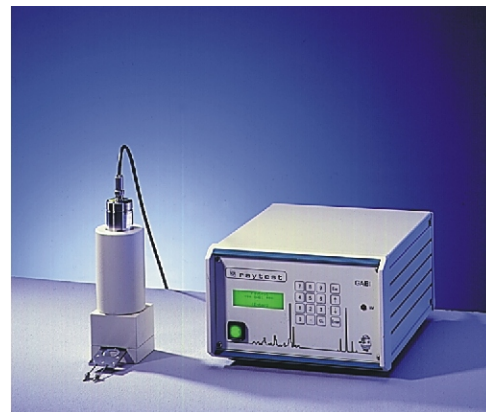
Application

GABI Star is a radioactivity flow-through detector for gamma, positron and high beta radiation.

GABI Star controls up to two different scintillation detectors of various types, dimensions and shapes of the scintillation crystal to optimize the performance for all applications, e.g.:

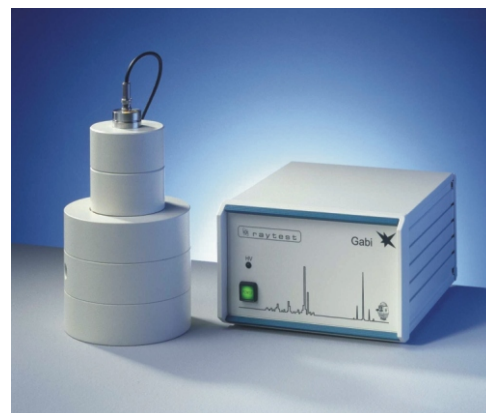
- Gamma & Positron HPLC, GC and CE
- Radioactivity flow through monitoring
- Process control
- Waste effluent monitoring
- Detection of byproducts of radioactively labelled compounds
- Single sample counting
- Total activity counting
- RIA counting
- Isotope dilution studies
- Food contamination studies

HIGHEST SENSITIVITY



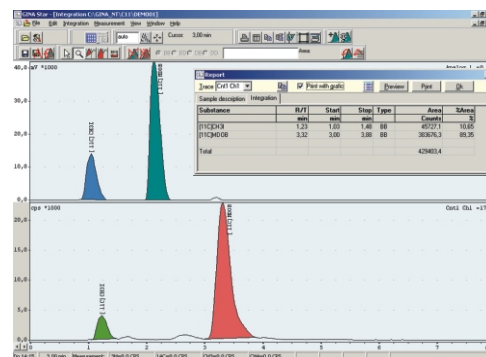
1x1 inch standard detector

- 1x1 inch Na(Tl) crystal
- Recommended energy range 10-150 keV
- Lead shielding with 10 or 30 mm wall thickness



2x2 inch standard detector

- 2x2 inch Na(Tl) crystal
- Recommended energy range 100-600 keV (high activity)
- Lead shielding with 50 mm wall thickness



Radio-HPLC-Chromatogram of [11C] MDOB and by products

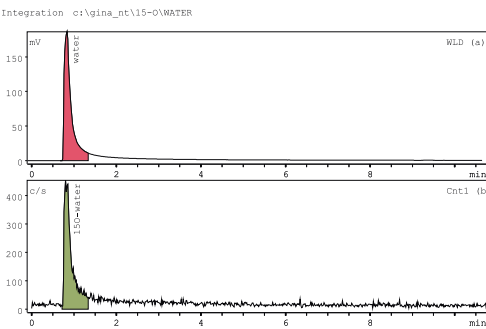
OPTIMAL RESOLUTION

- 2x2 inch pin hole detector.
- 2x2 inch Na(Tl) crystal with pinhole
- Recommended energy range 100-600 keV
- Lead shielding with 50 mm wall



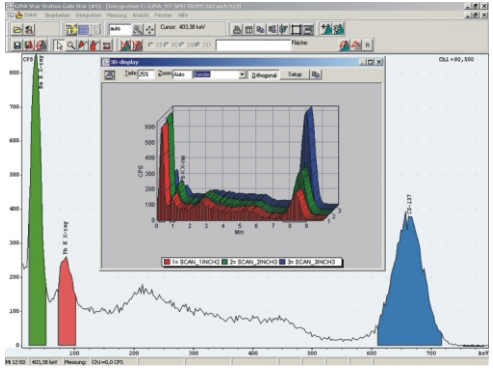
2x2 inch GC detector

- 2x2 inch Na(Tl) standard crystal
- Optimized for GC connection
- Temperature control for capillary heating up to 150°C



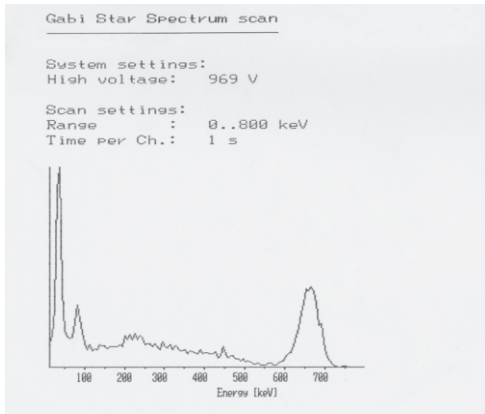
Radiogaschromatogram of 1µl [15O] H₂O, 0,55 MBq

WIDE DYNAMMIC RANGE



Spectrum scan with GINA Star

- 3-dimensional view
- Variable scan parameters



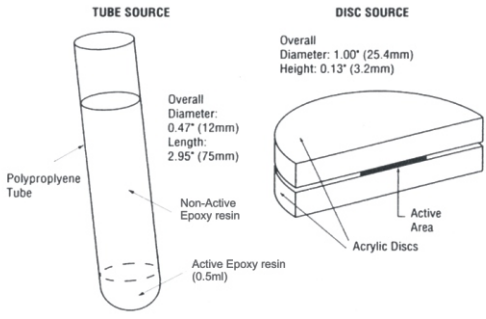
Spectrum scan

- In stand-alone and remote controlled mode
- Built-in energy calibration and high voltage scan for system setup
- Selectable scan range

FAST OPERATION

Cs-137 Tube / disc test source

- For energy calibration
- Performance test for regulatory requirements



Modular design

- CE, EMV approved
- Clearly arranged connectors
- Exchangeable plug-in boards for easy maintenance



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Technical Data

Power supply	110 V -120 V / 60 Hz or 230 V -240 V / 50 Hz \pm 10 %
Power consumption	40 VA
Dimensions (W : H : D)	250 x 160 x 320 mm (without detector)
Weight	5 kg (without detector)
Operating temperature	10°C to 40°C
Humidity	max. 70 % relative humidity
Count rate	up to 200 000 cps
HV range	500 – 2000 V programmable
Energy range	30 – 1600 keV
Background	1"x 1" NaI (TI) crystal 50 cpm 2"x 2" NaI (TI) crystalL 30 cpm
Efficiency	1"x 1" Standard NaI(TI) ¹²⁹ I max. 10 %, 1"x 1" Through hole NaI(TI) ¹²⁹ I max. 55 %,
Data output	RS232 interface 2 analog output channels range 0-1 V (overflow 150%) resolution 20 bit on external display
Data input	7 analog input channels range (-0.5 V to + 4.5 V), resolution 21 bit
Control signals	TTL signals for: liquid scintillator pump external Start/Stop measurement wait / active Relay contacts: 4 (programmable) fraction collector waste collector HPLC pumps: 3 x voltage control or 3 x frequency control



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RAGA Star



Radioactivity

Detector for

Gas

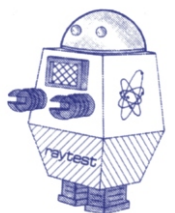
Chromatography



PET-GC monitor
RAGA Star PET



β -GC monitor
RAGA Star



3H, 14C-Labelled Compounds

Agilent GC 6890/ 6850

Low Detection Limit

System Description

RAGA Star is a radioactivity gas chromatography detector for ^3H and ^{14}C . RAGA Star uses a catalytic reactor closely positioned to the GC column, inside or outside the oven. ^{14}C labelled compounds are oxidized over CuO_2 to $^{14}\text{CO}_2$ and H_2O . H_2O is absorbed by a cartridge filled with MgO_2 . ^3H -labelled compounds (as well as ^{14}C) are reduced over platinum as catalyst to CH_4 . This way, there is no possibility of either condensation or tar formation and the same compound is always counted at the same efficiency.

Electronic Flow Control

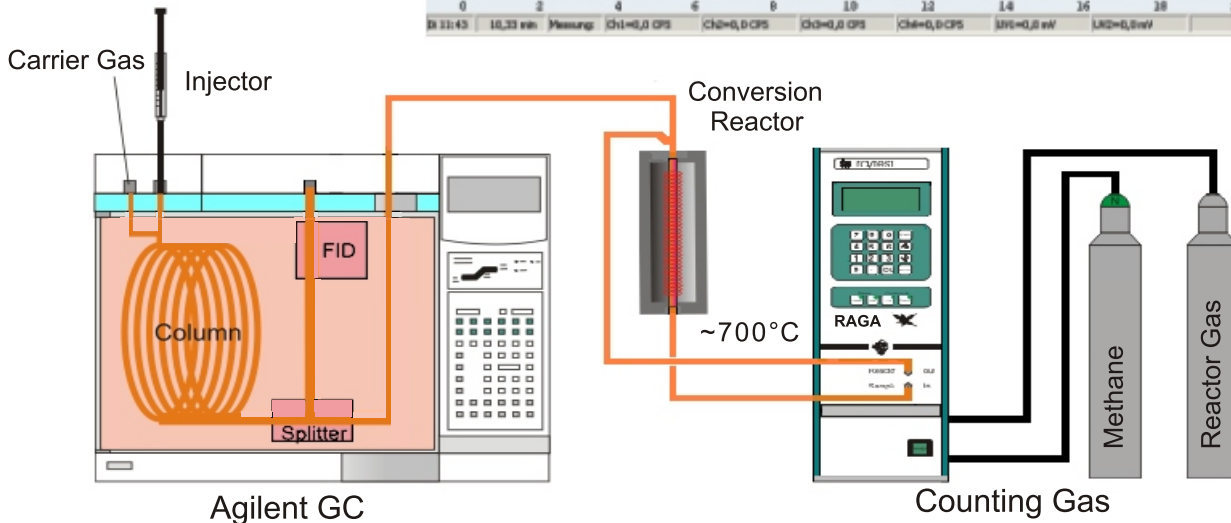
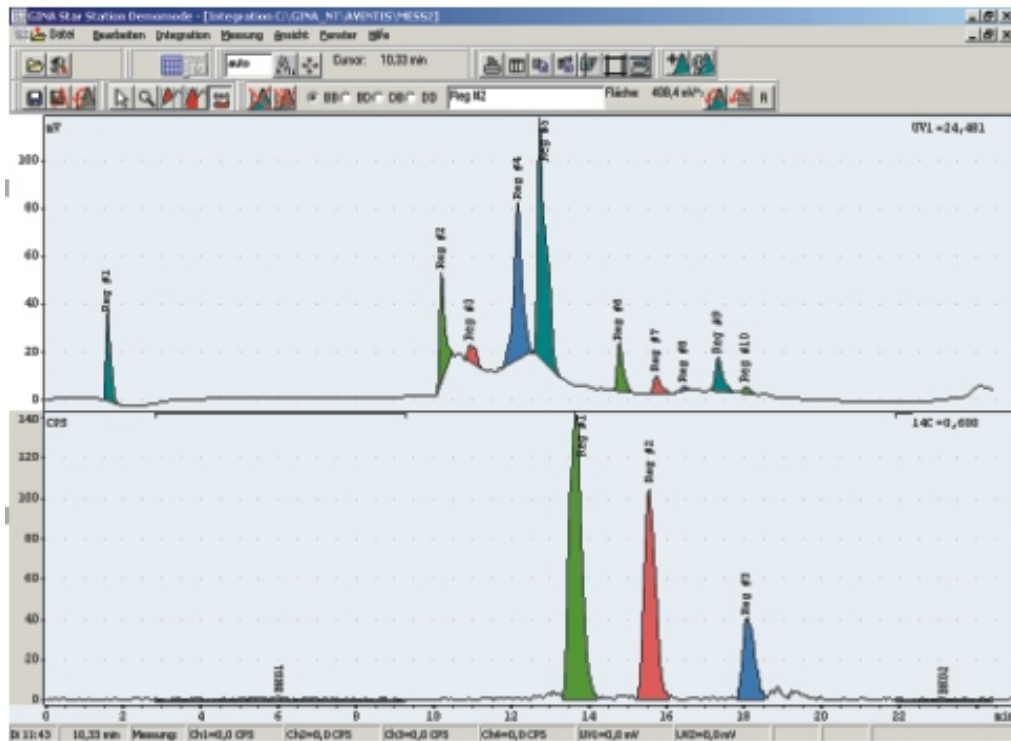
All gas flows are controlled by electronic flow regulators. Therefore adjustment work is reduced to a parameter input on the keyboard.

Integrated System Control

RAGA Star in combination with the GINA Star Chromatography data system offers total system control of the GC system (Agilent 6850/6890). This provides best usability since only one software system manages all method and meta data. The combination of Agilent GC and raytest RAGA Star operated by GINA Star software is fully compliant with all regulations about GLP.

High Sensitivity

The mixture of gaseous samples with the counting gas creates an ideal 4 pi counting geometry. Self-absorption of low energy beta particles is negligible as the sample molecule is in direct contact with its detection medium. A low-noise-high-sensitivity-preamplifier ensures that every radioactivity signal is counted.



PET-Radio-GC

PET-Labelled Compounds

PET-GC-Application

General description:

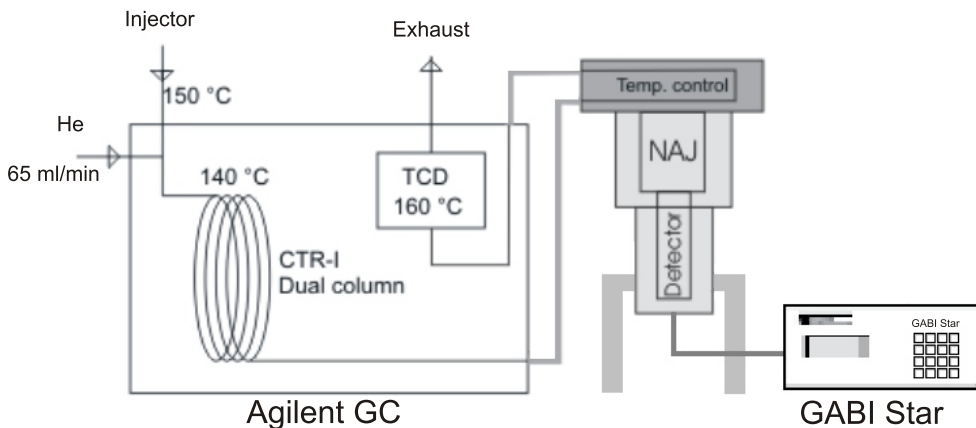
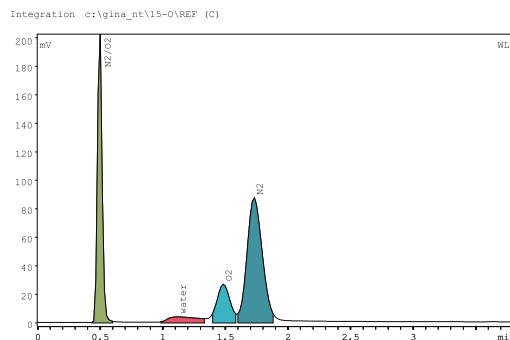
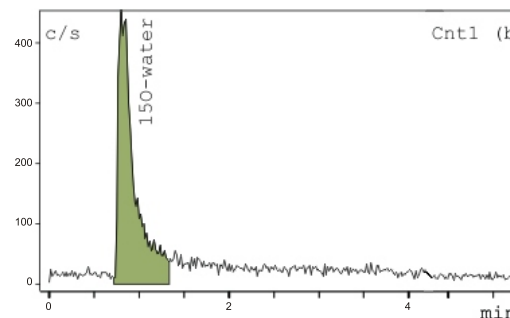
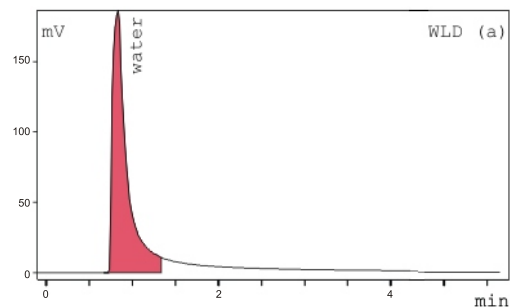
[¹⁵O]H₂O is prepared from [¹⁵O]O₂ gas (0.5- 4 % O₂ carrier) by catalytic combustion of H₂. It was suggested, that quality assurance and quality control criteria should include the random control of the [¹⁵O]O₂ gas before the catalytic conversion to the final product. Possible contaminants from the nuclear process ¹⁴N(d,n)¹⁵O are ¹⁵O labelled nitrogen oxides and ozon in the target gas mixture, are removed by suited traps. Contaminants from the competing nuclear reactions ¹⁴N(d,p2n)¹³N and ¹⁴N(d,αn)¹¹C are considered to be virtually absent below an incident deuteron energy of 7 MeV (¹³N<0.01%; ¹¹C <0.005%). Ammonia, NH₃, is a significant chemical, but not a critical impurity in the final product occurring from the reaction of N₂ with H₂ on the catalyst. The ammonia content of an [¹⁵O]H₂O injection may be controlled easily by careful observation of the pH solution's value. The specific activity concentration of a delivered radioactive dose of [¹⁵O]H₂O is modulated by the deuteron beam current.

PET-radio-GC

A dual column gas chromatography method allows the separation and identification of all labelled gases and water: [¹⁵O]O₂, [¹⁵O]H₂O, [¹⁵O]CO₂, [¹⁵O]CO and [¹⁵O]N₂O. A commercially available packed CTR-I dual column (Alltech Ass.) is used; outer column packed with molecular sieve (6ft x 1/4"), inner column packed with porous polymer mixture similar to Porapak Q (6ft x 1/8"). The He carrier gas flow is adjusted at 65 mL/min, the column temperature is set at 140°C. The sensitivity of a thermal conductivity detector is sufficient for stable gas analysis and a 2" NaI detector is used to trace the radioactive components. The sensitive volume of the flow cell should be at least 200μL and not more than 500μL due to broadening of the radioactive peaks. The injector temperature is set to 150°C, the detector temperature is 160°C. Standard 1/8" stainless steel tubing is used to connect the column to the radioactivity detector and the TCD. Additional heating of capillaries outside the chromatography oven is not necessary, thermal isolation is recommended.

Example:

The figure shows reference H₂O and [¹⁵O]H₂O. The reference chromatogram detected the stable components N₂ and O₂ (porous polymer - inner column), O₂ (molecular sieve - outer column) and water (porous polymer - inner column). The CTR-I column was purged before analysis at 250°C for 1h.



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Technical Data

β -radio-GC

Reactor

Length: 170 mm
Diameter: 44 mm
Tube inner diameter: 3 mm
Tube outer diameter: 6 mm
Heating voltage: 42 V, 150 W
Temperature: 600- 900°C
Thermo element: NiCr/ Ni

GC type Agilent 6850/90

Splitter: to be supplied
with GC
Column: packed or
capillary

Required Gases

Methane (counting tube)
Helium (for oxidation process) or
Hydrogen (for reduction process)

Detector

Proportional gas flow through
counter
Volume: 10 ml
Sensitivity: ^3H - 50 Bq
 ^{14}C - 3 Bq
Peak degradation: < 3 %
Analog input: 4 (only with
Gina Star)
Analog output: 1 (0- 1 V,
21 bit res.)
Dimensions (wxhxd): 16x54x42cm
Weight: 21 kg
Power supply: 95- 240 V,
50 Hz, 300 W

Technical Data

PET-radio-GC

Heated Transfer Line

Length: <1500 mm
Diameter: capillary
Insulation: to RT
Temperature: <150°C
Thermo element: NiCr/ Ni

GC type Agilent 6850/90

Splitter: not required
Column: packed or
capillary

Required Gases

(for radio-Detector) no gas

Detector

Scintillation probe: 2x2"
Shielding: 50 mm
Sensitivity: ^{15}O - 30 Bq
Peak degradation: < 1 %
Analog input: 4 (Gina Star)
Analog output: 1 (0- 1V)
Dimension: 26x15x36 cm
Weight: 6 kg
Power supply: 95- 240 V,
50 Hz, 40 W



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