

## XRF Testing For Hallmarking At The Goldsmith's Company Assay Office.

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### Goldsmiths Hall

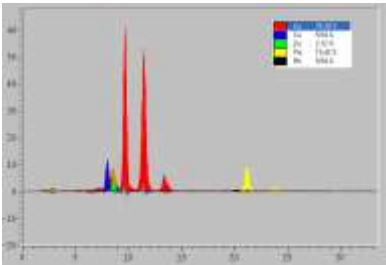
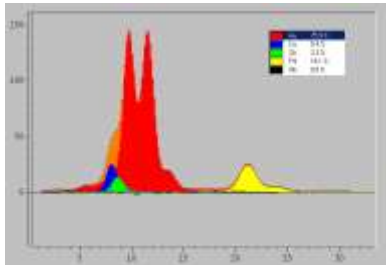


3 Finished and unfinished Jewellery



4 Detection comparison

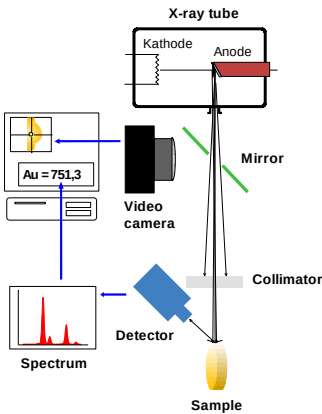
Comparison proportional counter tube and Si – PIN detector



5 XAN-DPP Xrf Instruments



6 XRF Basic principle



## 7 Parameters Influencing Precision in XRF

- Measuring Distance
- Collimator – test area – 0.2mm to 2.0mm
- Measuring Time – 60 seconds
- Positioning
- Focusing



## 8 Program comparison



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XRF Standards

| Metal Standard | Fineness ppt            | Alloying elements    |
|----------------|-------------------------|----------------------|
| Gold           | 375 585 750 916 990 999 | Cu Ag Ni Zn Pd       |
| Silver         | 800 925 958 999         | Cu Cd Zn             |
| Platinum       | 850 900 950 999         | Cu Co Au Ir Ru Rh Pd |
| Palladium      | 500 950 999             | Cu Ag Zn Ga          |



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Combined uncertainties

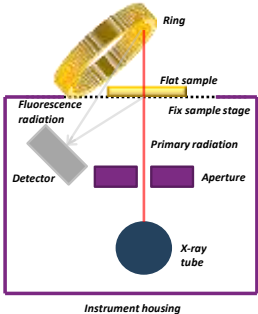
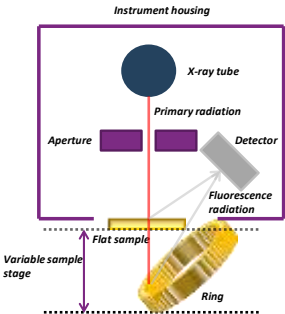
| Metal                   | Gold |      |      |      | Platinum | Silver   |
|-------------------------|------|------|------|------|----------|----------|
| Fineness                | 9ct  | 14ct | 18ct | 22ct | 950      | Sterling |
| Measurement uncertainty | 0.93 | 1.24 | 1.27 | 0.78 | 1.12     | 0.86     |
| Sample uncertainty      | 0.61 | 0.40 | 0.70 | 0.32 | 0.18     | 0.39     |
| Machine uncertainty     | 0.41 | 0.34 | 1.02 | 0.33 | 0.52     | 0.24     |
| Operator uncertainty    | 0.5  | 0.9  | 0.8  | 0.8  | 1.5      | 0.9      |
| Systematic uncertainty  | 1.36 | 1.95 | 1.90 | 2.17 | 2.17     | 1.42     |
|                         |      |      |      |      |          |          |
| Combined uncertainty    | 1.86 | 2.52 | 2.73 | 2.48 | 2.92     | 1.97     |



11 Non-plated and Rh plated items



12 Direction of measurement



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Geometric variations

|         | MD = 0, angle = 0° |         | MD = 25, angle 0° |         | MD = 25, angle 45° |         |
|---------|--------------------|---------|-------------------|---------|--------------------|---------|
|         | Mean               | Std.Dev | Mean              | Std.Dev | Mean               | Std.Dev |
| Au 99.8 | 99.77              | 0.044   | 99.67             | 0.049   | 99.63              | 0.049   |
| Au 74.6 | 74.66              | 0.075   | 74.57             | 0.22    | 74.48              | 0.19    |
| Au 58.8 | 58.86              | 0.054   | 58.79             | 0.15    | 58.81              | 0.13    |



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Rose gold plated layer on Silver



## 15 Mixed metal Bullion bars



*The*  
**GOLDSMITHS'**  
*Company*

